1992

Report on the Environment

BC hydro

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LETTER FROM THE SENIOR VICE-PRESIDENT

This is B.C. Hydro's first Annual Report on the Environment. It summarizes the work we have been doing to minimize the effects of our operations on the natural and social environment.

The decision to publish this report reflects our corporate commitment to be accountable for the environmental impact of our activities. It is an opportunity to review the activities of the past year in the context of current and future challenges.

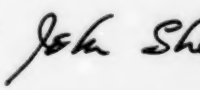
To achieve our environmental goals, we are developing new attitudes and technical expertise within the company. We are also forging new partnerships with governments, communities and special interest groups so that the province's resources can be sustained for uses such as recreation, fish and wildlife, and tourism, as well as for the production and distribution of electricity.

Though this is our first official annual environmental report, it is by no means an indication that B.C. Hydro has just "discovered" the environment. In recent years, we have become increasingly conscious of our environmental responsibilities and have already realized some significant achievements. For example, herbicide and pesticide use has been reduced by 80 per cent over the past 10 years, despite a 20 per cent increase in rights-of-way. Waste management is being addressed by reducing, reusing, recovering and recycling waste materials. And we have implemented more than two dozen Power Smart conservation programs as a demand-side management initiative to help meet future electricity requirements.

But though progress has been made, there are still many challenges that await our attention, no doubt including some which have yet to evolve and will take us by surprise despite our best preparations.

To meet these challenges, we will need to ensure that our environmental programs are properly financed. In turn this will involve difficult tasks in defining issues and consequences, as well as in evaluating options and associated costs.

Environmental priorities and objectives are now an integral part of B.C. Hydro. We know we share the natural environment with other segments of society. And we are acutely aware of our responsibility to meet our customers' electricity needs in a way that also meets society's environmental expectations. If this report reflects that attitude and provides a clear overview of our efforts in this field, it will have succeeded in its objective.



John P. Sheehan

CORPORATE COMMITMENT

B.C. Hydro is the third largest electric utility in Canada, serving approximately 1.3 million customers in an area containing over 92 per cent of British Columbia's population. As such, we share stewardship of many of the province's rivers and waterways, as well as the land used for generating stations, transmission and distribution rights-of-way, substations and other facilities. Between 43 000 and 50 000 gigawatt-hours of electricity are generated annually, and delivered to customers through an interconnected system of more than 68 000 kilometres of transmission and distribution lines. Over 90 per cent of that electricity is produced by hydroelectric generating stations, mostly from the Columbia and Peace river systems.

We are intensely conscious of the magnitude of these operations. In addition, we are determined to assume an environmental leadership role that goes beyond simple compliance with federal, provincial and municipal regulations and legislation. Consequently, our commitment to the environment has been formalized at the highest corporate level through the following resolution by B.C. Hydro's Board of Directors:

"In carrying out its business, B.C. Hydro will minimize adverse effects on the natural and social environment and actively pursue opportunities to manage our resources for the benefit of present and future generations."

ENVIRONMENTAL MANAGEMENT

To carry out our environmental mandate, Hydro maintains staff with technical expertise in the areas of vegetation and pesticide management, agriculture, soils and terrain, wildlife, fisheries, water quality, air quality, meteorology, pollution control, hazardous waste management, recreation, socio-economics, land use, construction inspection and major program coordination and management. In addition and when necessary, external specialists and contractors are employed to assist with specific projects.

Expenditures on environmental activities related to capital projects are included as part of the project budgets. Environmental activities not capitalized are charged against operations, maintenance and administration.

COMPREHENSIVE ENVIRONMENTAL PROGRAMS

ENVIRONMENTAL AUDITS

Environmental audits evaluate the performance of environmental programs against internal policies and procedures, external regulatory requirements and prevailing environmental management practices. Audits conducted in 1991-92 addressed the following.

- Management of polychlorinated biphenyls (PCBs), including handling, storage and transportation of PCB-contaminated oil and/or equipment containing PCBs. The results showed that requirements are generally being met and identified necessary improvements, some of which already have been made.
- Environmental protection measures for the Alouette Dam spillway rehabilitation project. It was determined that the environmental management plan had successfully protected fish habitat and water quality during construction.
- A management system for oil spill containment. Recommendations were made for assessing environmental risk, enhancing the proposed program and developing a comprehensive oil spill management system.

ENVIRONMENTAL INTEGRITY REVIEWS

These reviews were initiated during 1991-92 to address environmental security, compliance with existing government regulations, and liability arising from any potential environmental damage at existing plants or facilities. The first reviews were undertaken and completed at five diesel, one gas-fuelled and two gas turbine generating stations as well as an electric shop.

Each review concluded with a written report — including, where applicable, recommendations for improvements — to managers responsible for operation of the facilities. Because the reviews will be ongoing, progress will be monitored and technical assistance provided where required.

MAJOR PROJECT COMPENSATION PROGRAMS

In 1988, B.C. Hydro and the provincial Ministry of Environment, Lands and Parks began developing fish and wildlife compensation programs to address water licence requirements of Hydro's hydroelectric developments.

Prior to the 1960s, neither environmental assessments nor compensation for the environmental impact of major projects was required in B.C. During the next two decades, one-time compensation payments were made to the Crown, as a condition of some water licences granted by the Comptroller of Water Rights. If the compensation activities undertaken did

not adequately meet resource requirements or were ineffective, no recourse was available as the funding was already spent. This situation often resulted in resource issues not being addressed by either the government or Hydro.

Major project compensation programs now recognize that:

- Compensation programs must be designed to address immediate environmental concerns as well as long-term needs and issues.
- The success of these programs is dependent on effective and cooperative relationships between government agencies, Hydro and those stakeholders and/or members of the public with an interest in the natural resources affected.
- The programs must be flexible enough to respond to changing environmental standards and public expectations.

The compensation programs developed cooperatively by the B.C. Ministry of Environment, Lands and Parks and Hydro for the Peace and Columbia river areas now serve as building blocks and models for future programs.

PEACE FISHERIES AND WILDLIFE COMPENSATION PROGRAM

Approximately 30 per cent of Hydro's total generating capacity comes from the W.A.C. Bennett Dam, constructed in the late 1960s, and Peace Canyon Dam, completed in 1979. An $11 million compensation fund was established in 1988 to enhance the fish and wildlife resources of the upper Peace River area. Earnings of the fund are to be used each year for enhancement and resource management programs, developed with public consultation and participation. A total of $2.63 million had been spent at March 31, 1992.

Fisheries programs included developing a watershed management plan for species and habitats; stocking kokanee and rainbow trout in selected tributaries and small lakes; habitat improvement projects, and helping local groups carry out fisheries-related enhancement programs.

Wildlife programs included creating habitat through prescribed slash burning; wetland enhancement programs, many carried out in co-operation with Ducks Unlimited; re-establishing the sheep population on Mt. Frank Roy, and purchasing important winter range areas.

MICA FISHERIES AND WILDLIFE COMPENSATION PROGRAM

Initiated in 1991, this program addresses resource impacts associated with completion of the Mica Dam on the Columbia River in 1973 and the Non-Treaty Storage Agreement of 1990.

The B.C. Ministry of Environment, Lands and Parks and Hydro agreed that, prior to establishing a trust fund, preliminary studies should be carried out to develop five-year plans for fish

and wildlife enhancement and management in the Kinbasket and Revelstoke watersheds. Activities carried out in 1991-92 included compiling an inventory of fish and wildlife and resources enhancement opportunities in the Mica and Revelstoke drainage basins, as well as carrying out a number of small enhancement projects such as clearing debris from streams.

RESEARCH AND DEVELOPMENT

Various research and development projects are conducted by Hydro's subsidiary, Powertech Labs Inc. During the past year about 40 projects, conducted at a total cost of $11.16 million, had an environmental focus.

CEA PROJECTS

In addition, Hydro's membership in the Canadian Electrical Association (CEA) enabled us to sponsor or participate in a number of environmental research and development projects, including:

- Application and market assessment of fuel cells in the Canadian electric system;
- Prospects for electric vehicles in Canada and their impact on electric utilities;
- Microwave and radio frequency heating technologies for hazardous waste treatment.

ENERGY EFFICIENCY TESTING

Energy efficiency projects included testing commercial and prototype ballasts, fluorescent energy savers, reflectors and luminaries for energy efficiency; testing electronic ballasts as co-funding of a CEA project, and more than 20 efficiency tests on 5- to 20-horsepower three-phase motors.

RESERVOIR CARBON STUDY

This strategic project examines the role of Hydro's reservoirs in the province's carbon dioxide cycle and complements case studies by other agencies to form the "B.C. Carbon Project." The study is scheduled for completion in mid-1993.

ROUTINE TESTING

Routine projects tested water quality, analysed fresh water samples for the Columbia River aquatic monitoring programs and waste water, identified PCBs in oils and soils and supplied reagents used to detect PCBs in spot testing programs.

ENERGY RESOURCES MANAGEMENT

Most environmental activities mitigate the impact of existing operations on the province's natural resources. However, energy resources management initiatives which seek to defer construction of new generating projects by reducing electricity demand also warrant inclusion in a report on environmental activities.

CONSERVATION

POWER SMART

Power Smart was launched in 1989 to develop and promote cost-effective programs that motivate customers to be more energy-efficient. Its goal is to save 5600 gigawatt-hours (roughly about the amount of electricity now consumed by Vancouver and Richmond combined) by the year 2010. At March 31, 1992, savings attributable to Power Smart had reached 724 gigawatt-hours (enough electricity to serve a city slightly larger than Kamloops). There are about 25 Power Smart programs, each designed for a particular end-use segment of the residential, commercial or industrial customer base.

CONSERVATION POTENTIAL REVIEW

The Conservation Potential Review seeks to determine the technological, social and economic potential for electricity savings or reductions in B.C. to the year 2010. Believed to be the first collaborative effort of its kind in the Canadian utility industry, the review is being overseen by a 13-member collaborative committee with the participation of 33 commercial, industrial and residential customer interests, environmental organizations, local governments and aboriginal groups, as well as West Kootenay Power Ltd. and B.C. Hydro.

RESOURCE SMART

Resource Smart is Hydro's initiative to increase the amount of electricity available by increasing the efficiency of our existing generation, transmission and distribution facilities. Ways of doing this include installing additional generating capability at existing dams, raising reservoir levels or lowering tailwater levels, and upgrading turbine efficiency by retrofitting equipment.

Resource Smart began in 1987 by identifying additional energy opportunities that could be realized from existing facilities. Potential annual savings that could be realized economically are estimated at 4500 gigawatt-hours. By March 31, 1992, Resource Smart savings of 844 gigawatt-hours had been achieved.

FISH AND WATER RESOURCES

B.C. Hydro relies on 39 reservoirs and 30 hydroelectric generating stations for the bulk of its electricity production. Operation of these facilities can affect the province's fish and water resources. Many of these facilities were built when concern for natural resources and the environment had a lower priority than it does today.

A number of initiatives are being used to address the impacts of Hydro's existing and future operations on fish resources. These include specific studies for impact assessment, habitat enhancement programs, research and monitoring. Many of these initiatives are being undertaken through the Major Project Compensation Programs described earlier (see pages 3 to 5).

OPERATIONAL IMPACTS

Because Hydro's system is designed and operated for maximum power generation, water levels and flows are continually adjusted. However, operating requirements are now being balanced with the need for controlled water releases for the benefit of fish habitats, and for flood control.

A review of all operating orders is identifying opportunities to make operations more sensitive to environmental concerns. In a process which began in 1991, reviews will result in establishing protocols for fish water releases and for containment procedures in the event of oil spills. Reviews are currently under way for the Cheakamus, Bridge/Seton, Coquitlam and Revelstoke systems.

Work also began on drafting a preliminary strategy for addressing fish and water quality issues and setting minimum flow requirements. Reports on the operational impacts of existing Hydro facilities on fisheries resources have been completed, co-funded by Fisheries and Oceans Canada and the B.C. Ministry of Environment, Lands and Parks.

A major study is under way on Vancouver Island's Salmon River to look at flow and habitat requirements of various fish species during different life stages, and the impacts of water depth, velocity, substrate and temperature on these stages. The intent is to determine operating procedures that would be responsive to fish needs.

THERMAL PLANT EFFLUENTS

The federal and provincial governments have expressed increasing concern over the past few years for water quality, and particularly the health of fish, in Vancouver's Burrard Inlet. Hydro is one of many industries on the Inlet that submit quarterly water quality reports to the B.C. Ministry of Environment, Lands and Parks. Hydro's only thermal facility is the Burrard

Thermal Generating Station, near Port Moody. It currently meets all permitted discharge levels. However, the feasibility of de-chlorinating cooling water discharges is being investigated. *(For further information on the Burrard Thermal plant, please see the Air Quality Management section on page 12.)*

HABITAT ENHANCEMENT PROGRAMS

A number of fish habitat enhancement programs are under way which either exceed water licence requirements or are being carried out at older plants where there are no such licences. Recent examples include the following.

- Side channels designed for habitat improvements on the Puntledge River system, funded jointly by the B.C. Ministry of Environment, Lands and Parks, Fisheries and Oceans Canada and Hydro. A similar program is being developed for the Campbell River.
- A net pen installed at Buntzen Lake in the Lower Mainland for rearing and release of about 5000 cutthroat and rainbow trout from the Abbotsford Hatchery. The program, which will improve the survival of stocked fish in the lake, has been increased to 15 000 cutthroat trout to be released in summer 1993.
- Instream habitat improvements on the Bull and Stave rivers.
- A program developed to address outstanding fisheries issues associated with the Bridge River project.
- A fish flow study conducted on Vancouver Island's Salmon River, work with other agencies to remove a barrier in the river canyon, and, in cooperation with Fisheries and Oceans Canada, installation of a new fishway at the Salmon River Dam.

RESEARCH AND MONITORING PROGRAMS

Field studies to monitor aquatic systems affected by Hydro's operations and identify measures to protect and improve fish habitat, undertaken in cooperation with fisheries agencies, included the following in 1991-92.

- Monitoring changes in fish population, aquatic productivity and nutrient balances in the Kinbasket, Arrow and Revelstoke reservoirs.
- Testing for total dissolved gases from plant operations at Keenleyside Dam.

• Defining the operational impacts of water flow changes in rivers and reservoirs on the fish and other organisms dependent on natural flows.

Techniques to protect fish from passing through turbines at older plants also are being researched. Experiments were conducted on the Puntledge Dam using behavioral devices and electric fields to divert salmon smolts past power intakes. Neither method was effective. A fish screen in the penstock appears to be the best solution available for preventing turbine passage mortalities. Such a screen is being designed for installation in 1993. However, because other species such as small pink salmon fry can be harmed by screening, research continues into alternative methods for other hydroelectric plants.

MERCURY IN RESERVOIRS

A human health issue is the effect of eating fish containing elevated mercury levels. While mercury is a natural occurring element, there is some evidence that reservoir creation increases the amount of mercury leached out of soil and rock and from decaying vegetation.

Since 1990, Hydro has monitored mercury concentrations in 13 reservoirs and large lakes throughout B.C. The results showed that, with the exception of Williston Lake reservoir, tested levels were near or at naturally occurring levels.

Williston Lake, which lies adjacent to a naturally-occurring mercuriferous zone, shows evidence of bio-accumulation in large predator fish species such as bull trout (formerly Dolly Varden char). Health and Welfare Canada has re-issued an advisory to anglers to limit consumption as a precautionary measure.

LAND MANAGEMENT

Land resources are affected wherever Hydro builds, changes or operates its distribution and transmission lines, generation projects and other facilities. Effective management of these resources assesses and minimizes the impact of Hydro operations on agriculture, forestry, wildlife, terrain and vegetation.

RIGHTS-OF-WAY MANAGEMENT

Safe and reliable management of Hydro's more than 68 000 kilometres of transmission and distribution powerlines requires that tall-growing trees and shrubs not be permitted to grow in the rights-of-way. At the same time, methods used to achieve this must also recognize the importance of vegetation for such things as erosion control and wildlife browse and the need to create an aesthetically pleasing appearance for other users of the land.

Vegetation management techniques used by Hydro include the following.

- Promoting compatible secondary uses of rights-of-way, including farm crops, tree nurseries and Christmas tree farms.
- Biological controls using plants and animals to control or discourage undesirable vegetation. These controls include maintaining dense, low-growing native plants that provide excellent browse for wildlife, or bringing in grazing animals. For example, grasses and legumes are planted in range land areas as forage for cattle, and trials with sheep are under way in the Hudson's Hope area.
- Physical or manual controls, such as selective pruning, cutting and clearing, as well as replacing tall-growing trees with lower-growing varieties.
- Chemical controls using selectively-applied herbicides, such as capsules injected into stems or a wipe-on herbicide applied to freshly cut stems to prevent resprouting. In the past year, Hydro applied herbicides to 1241 hectares of rights-of-way, using only about 20 per cent of the herbicides that would have been used 10 years ago. However, practical difficulties associated with powerline maintenance indicate that it may be difficult to sustain such a low level.

Rights-of-way management activities in 1991-92 included the following.

- A Sunshine Coast Vegetation Management Committee was formed to determine a long-term plan for vegetation management techniques to be used in that region. Committee members represent regional districts, forestry, rod and gun clubs, public interest groups and other Hydro stakeholders.

• Each herbicide application followed a process set out in the Waste Management Act of B.C. for Pesticide Use Permits. The process requires planning, advertisements, public information programs, addressing community concerns, making appropriate amendments, giving pre-job instructions to contractors, and inspecting the work in progress. Approximately 50 reports on the amount of herbicides used in permitted areas were submitted to the provincial Pesticide Management Branch.

• To ensure methods of handling pesticides are safe and environmentally sound, a Pesticide Management Task Force was established to review acquisition, storage, transportation, permitting, use and disposal of pesticides throughout Hydro's operations, and a consulting firm was retained to help identify pesticide issues requiring attention.

Thousands of customer calls regarding line-clearing issues are received annually by Hydro's District offices. These calls range from questions and complaints about clearing procedures to requests for advice about and/or assistance with planting on private land under or near rights-of-way. All calls are handled on an individual basis by the district, area or regional offices.

WILDLIFE HABITAT

Major wildlife initiatives were carried out during 1991-92 under the Peace and Mica Compensation programs (see page 4).

Most other procedures that protect wildlife from being affected by Hydro operations were designed also to ensure the security of the electric system. For example, non-functioning poles have been installed parallel to the operating poles to divert nesting osprey from in-service power lines, and transmission lines have been enhanced with visual markers to prevent birds from flying into the lines. Hydro also funded a catch-and-release program to remove approximately 40 marmots from the Ashton Creek substation near Enderby.

To ensure that other wildlife and forestry issues are addressed, a management strategy was outlined in 1991-92 and will be developed further in the coming year.

AIR QUALITY MANAGEMENT

Because hydroelectric generation has little if any impact on air quality, B.C. Hydro-related issues in this area have tended to revolve around the Burrard Thermal Generating Station near Port Moody. But the relatively recent emergence of air quality issues such as the "greenhouse effect" has broadened Hydro's air quality management responsibilities, with particular emphasis on the very significant impact of cars and trucks in urban areas. Hydro is prepared to consider funding other approaches to this problem.

THERMAL PLANT EMISSIONS

Concern for deteriorating air quality has resulted in the Greater Vancouver Regional District's initiative to reduce various air emissions, including nitrogen oxides (NOx), by 50 per cent by the year 2000. About 64 per cent of NOx emissions comes from motor vehicles, 14 per cent from trains, airplanes and ships, 17 per cent from industry and the balance from local area sources such as home heating.

Hydro's only industrial plant in the Lower Mainland is the Burrard Thermal plant, built in the 1960s and 1970s and issued an emissions permit by the GVRD in 1985. Burrard is fuelled by natural gas, the cleanest-burning of all fossil fuels.

Burrard is Hydro's fourth largest generating station and supplements the hydroelectric system's fluctuating generation capability. As a result, in some years the plant has been inoperative except for test purposes, while in others its production has been as high as 4200 gigawatt- hours. If run at maximum capability of 5500 gigawatt-hours per year, Burrard would contribute about four per cent of the total NOx emissions in the Lower Mainland.

A concerted effort from 1985 to 1991 resulted in a 40 per cent reduction of air emissions from Burrard, but any additional reductions using existing equipment are not practical. However, the plant now operates at a level well within the standards set by the GVRD.

During the past year, work began on a Burrard Utilization Study. This study is examining the full range of options for Burrard, from shutdown to operation on a continuous, maximum-capacity basis. It will include evaluation of the environmental, social and economic impacts of the various options.

In addition, engineering studies to evaluate retrofitting technologies have been completed, and a plan and schedule are being developed to realize further emission reductions. It is expected that in excess of $100 million, most of which would be for emission controls, would be required to upgrade Burrard.

OTHER AIR QUALITY ISSUES

FLEET EMISSION REDUCTION PROGRAM

In 1990, Hydro launched a five-year program to reduce emissions from its Lower Mainland fleet of about 600 light trucks and automobiles. This is being done by the gradual replacement of older, high-emission vehicles (i.e. those made prior to 1987) with newer, low-emission models. This program was developed and implemented with the assistance of Hydro's research subsidiary, Powertech. As part of the overall study, an electric-powered van was purchased, equipped with data loggers to monitor the function and performance of its batteries, and placed in the Lower Mainland fleet for testing.

DUST FROM RESERVOIR DRAWDOWN ZONE

As reservoir water levels fall, an area called the drawdown zone is exposed to the erosive forces of the wind which carry fine silt or dust to neighboring communities. Revelstoke, at the northern end of the Arrow Lakes, is the largest B.C. community affected by such wind-blown dust, although the smaller communities of Burton and Nakusp are also affected.

Hydro began seeking solutions to the Revelstoke dust problem in the mid-1970s. It was eventually found that planting certain species of vegetation was the most practical and cost-effective control method for the approximately 10 000 acres exposed when the reservoir is at its lowest. In 1991, an experimental seeding program using fall rye was used on about half of the exposed area. As a result, there were no major dust storms, despite weather conditions similar to those in 1990 when there were six. Additional benefits were increased wildlife habitat, fish food sources and improved aesthetics.

Since fall rye requires annual planting, research is continuing into native perennial plants that can endure the flooding/drawdown cycle typical of a water storage reservoir.

CFCS

As part of B.C. Hydro's Power Smart program a rebate of $50 is offered to encourage customers to turn in older, inefficient or unnecessary refrigerators. Before the hulks of these appliances are scrapped, the refrigerant material — comprised of upper atmospheric ozone-depleting chlorofluorocarbons (CFCs) — is collected and returned to the manufacturer for recycling.

WASTE MANAGEMENT

B.C. Hydro's operations create a wide variety of waste materials, ranging from hazardous and special industrial wastes from substations, line rooms, generation plants and vehicle garages, to the more commonplace paper and other materials from office buildings.

In 1991 a Comprehensive Waste Management Strategy was introduced, based on the "Four Rs" of waste management — reduction, reuse, recovery and residuals management. The strategy aims to reduce waste by 30 per cent of 1990 levels by 1995. Its first phase was completed during 1991-92 and included the following.

- An inventory of waste types, quantities, disposal methods, and recycling activities as well as employee suggestions for waste reduction or waste management improvements.
- An industry survey and literature review of waste management strategies in the public and private sectors.
- Preliminary recommendations for waste reduction programs.

From these an action plan will be developed to implement strategies and activities for reducing waste generation and maximizing materials recovery. Strategies used during 1991-92 to reduce, reuse and recover waste materials included the following.

- Introducing re-refined oil for use at Hydro's major garages.
- Recycling approximately 90 per cent of all waste oils.
- Finding a B.C. supplier who could re-use old streetlight fixtures, which were formerly scrapped.
- Collecting and recycling between 70 and 80 per cent of all office paper purchased by Hydro's Lower Mainland offices.
- Awarding a contract to a Richmond-based firm for 18 million environmentally-friendly kraft-coloured envelopes.

SPECIAL WASTES

Special wastes, as defined by the Waste Management Act of B.C., are dangerous goods no longer used for their original purpose. They include waste oil, asbestos, PCBs and pesticides.

Large volumes of waste oil are generated when lubricating oils are changed and hydraulic oil is replaced. These are recycled internally by Hydro or by external companies such as Mohawk Oil. Some speciality oils are sent out of province for recycling or disposal.

Smaller volumes of special wastes such as asbestos and pesticides which cannot be reused or recycled are disposed of in accordance with government regulations. PCBs are a special case and are addressed below.

Acids, caustics, solvents, paints and other miscellaneous chemicals are recycled or disposed of with local companies, as volumes are not significant.

PCBs

PCBs were recognized as a problem material in the mid-1970s. Programs undertaken to date to manage this issue include the following.

- All pure PCB pole-top distribution capacitors have been removed from areas accessible by the public.
- All pure PCB transformers have been taken out of service.
- About half of all B.C. Hydro-owned PCB capacitors have been phased out and replaced with non-PCB capacitors. The remaining capacitors are all within secure substations and spill containment matting is provided.
- Secure storage has been developed for the phased-out equipment.
- Most substation transformers have been tested and, of those found to have oil contaminated with greater than 50 parts per million (ppm) PCB, 80 per cent have been drained and refilled with PCB-free oil.
- Pole-top distribution transformers in environmentally sensitive areas such as those near watercourses, schools, hospitals or playgrounds have been tested and those with more than 50 ppm of PCB in their oil have been replaced. Of 225 000 distribution transformers in the system, 114 000 remain to be tested.
- Oil testing programs have identified approximately 6 000 000 litres of oil contaminated in excess of 50 ppm PCB. Approximately 4 500 000 litres have been decontaminated in B.C. Hydro's patented decontamination plant in Surrey.

EMERGENCY RESPONSE PROCEDURES

Specific spill contingency plans for dealing with accidental releases of oil, antifreeze or similar substances at diesel generating stations have been prepared and are updated on a regular basis.

Spill response plans have been developed to deal with electrical equipment incidents which result in releases of oil, including PCB-contaminated oil. Hydro employees receive regular training in how to control spills. Similar programs are in effect to respond to fires.

SOCIAL RESOURCES

Responsible environmental stewardship includes concern not only for natural resources but also for the social and economic well-being of communities affected by Hydro's operations.

RECREATION SITE MANAGEMENT

Approximately 600 000 people visited Hydro's 14 recreation sites during 1991-92 and the numbers are growing annually. The annual budget for maintaining, improving and developing recreational sites in fiscal 1992 was $540,000 in operating costs and $600,000 in capital. Some of the projects completed during the year were the following.

- Paving roads and the parking lot at the Seton Lake recreation area near Lillooet.
- Upgrading public washrooms and, with assistance from the Canadian Army Engineers, constructing a suspension bridge for hikers at Buntzen Lake.
- Constructing a campground at Seven Mile Reservoir (Buckley site).
- Developing a community park adjacent to Bridge River Powerhouse at Shalalth.
- Paving the road and parking area and providing new toilets, signs and picnic tables at Ruskin and improving access for fishing on Stave River downstream of the dam.
- Enhancing and doubling the size of the Hayward Lake site.
- Replacing the viewpoint platform at Shuswap Falls.
- Funding a public boat ramp constructed by the District of Hudson's Hope adjacent to W.A.C. Bennett Dam on Williston Lake.
- Assisting with development of a trail system at the John Hart development on the Campbell River.

RESERVOIR CLEARING

Approximately $2 million was spent during the year on clearing wood debris from Hydro reservoirs. At Williston Lake, the largest reservoir, $100 million has been spent over the past 30 years, reducing the area with debris from 4000 to 400 hectares.

ELECTRIC AND MAGNETIC FIELD EFFECTS

Hydro has appointed a full-time project manager to provide information to the public on the question of whether electric and magnetic fields may adversely affect human health, and provides support for new independent research on the

subject. Regional support staff have also been trained to improve availability of field measurements for customers.

Powertech, on behalf of Hydro, conducted four projects dealing with the measurement of magnetic fields in Hydro's generating system, cable circuits and in residential neighborhoods. Three other projects collected research information and literature on the effects of magnetic fields.

OTHER SOCIAL ISSUES

RIGHTS-OF-WAY ISSUES

A program was initiated to develop policies that reflect the need to resolve rights-of-way and operational issues in a way that is both responsive to public concerns and cost-effective. The program will cover all transmission and distribution line corridors over a 50-year horizon. Studies intended to be completed by the end of March 1993 will be done on clearing, width, undergrounding, easement agreements, secondary use, and reliability and quality of electric service.

ACCESS TO LOCAL CONTRACTOR BENEFITS PROGRAM

To help residents of B.C.'s smaller communities obtain contracts for right-of-way clearing and maintenance programs, workshops were held in Nanaimo, Prince Rupert, Pemberton and Lillooet to explain how to submit bids and to address any concerns potential contractors had about standard practices. More such workshops are planned.

NOISE CONCERNS

The growth of urban development around existing Hydro facilities has resulted in some concern about the effect on neighbouring communities from high noise levels generated by power transformers in large substations and small distribution transformers. During 1991-92 an electronic noise cancelling prototype was developed at Surrey's Ingledow Substation. Acoustic enclosures were installed at two other substations and are being considered for other locations.

ENVIRONMENTAL INCIDENTS

Environmental incidents are accidental and unexpected events or actions. They may, though not necessarily, require involvement of regulatory authorities, and they often result in altering operational procedures to prevent recurrence.

FISH AND WATER RESOURCES

BRIDGE RIVER

High inflows and unusually heavy rains in summer 1991 at the Terzaghi Dam near Lillooet caused a series of spills that disturbed fish habitat and resulted in the risk of stranding fish when flows were reduced. An extensive fish salvage operation was undertaken to relocate fish to the flowing portions of the river. A study identified options for establishing a minimum flow release and spawning and rearing habitat improvements for implementation in 1992-93.

The same weather conditions also affected the Seton River, requiring the spilling of water during salmon migration and spawning. Due to a communications breakdown after the need to spill water had passed, the discharge was abruptly reduced and about 150 pink salmon were stranded and spawning grounds exposed. A complete review of operating orders and water management has been initiated for the Seton/Bridge system to incorporate environmental concerns with the necessary changes made to protect fish in the future.

SHUSWAP FALLS PLANT

Operation of the Shuswap Falls Generating Station, on the Shuswap River near Lumby, is critical to the survival of kokanee, chinook and coho salmon populations as well as several other sport fish populations. Water release strategies have been developed over the years to avoid stranding during spawning and to provide continuous discharges during egg incubation.

In the fall of 1991, Fisheries and Oceans Canada requested the release of higher flows. Unfortunately, fall rains did not provide sufficient inflows into the system, requiring a reduced discharge into the river and resulting in the dewatering of many of the eggs.

NORN'S CREEK

Declining releases from the Keenleyside Dam on the Columbia River near Castlegar in late spring 1991 resulted in temporary dewatering of rainbow trout spawning grounds at the mouth of Norn's Creek. Though operations at Keenleyside, being controlled by the Columbia River Treaty are less flexible than those at other Hydro facilities, it

was possible to provide a high enough discharge in June to save most of the eggs. Hydro is working with the federal and provincial governments to develop alternative discharge regimes within the Treaty limitations. As a long-term resolution to the problem, improvements to spawning habitat in both Norn's Creek and the Columbia River are being examined.

CHEAKAMUS RIVER

When the Daisy Lake Dam was constructed south of Whistler in 1957, no resolution was made as to the appropriate water release into the Cheakamus River to protect fish stocks. A study was begun in 1991 to determine the appropriate fish water releases.

WASTE MANAGEMENT

SURREY ELECTRIC SHOP

Approximately 11.2 kilograms of caustic degreasing solution was accidentally drained into the shop's floor sump, through the oil/water separator and into a ditch that empties into Bear Creek. Immediate actions were taken to stop the flow, and to dilute and then neutralize the liquid for transfer to a storage tank. An estimated 20 per cent of the solution escaped into the creek. A number of changes have been made at the shop to prevent a recurrence.

PCBS

A 25-kilovolt transformer overload in Vancouver spilled about 140 litres of PCB-contaminated transformer oil. When an oil sample taken for analysis found 156 ppm of PCB, the contaminated soil was excavated for secure storage and replaced with clean soil.

Nine 205-litre barrels of contaminated oil from the Canadian Forces Base (CFB) at Comox were received at PowerServ Pacific Inc., a B.C. Hydro joint venture facility for electric apparatus repair and oil treatment and reclamation. Information about the shipment indicated the oil could be handled according to regulations established for PCB contamination at less than 500 parts per million, but during handling it was discovered to be much more heavily contaminated. The contaminated oil was removed to safe storage, holding sumps where it had been held were drained and rinsed with clean oil that was also pumped into storage, and contaminated sludge was segregated and pumped into drums. Responsibility for the incident and associated costs was assigned to CFB Comox. To guard against a recurrence, PowerServ Pacific is providing additional training and introducing new procedures for PCB barrel handling and sump operations.

LOOKING TO THE FUTURE: CORPORATE ENVIRONMENTAL PLAN

B.C. Hydro's major strategic environmental initiative is the development of a corporate environmental long-term plan. This plan is intended to ensure the consistent implementation of the Board's environmental resolution and related principles.

A major component of the plan will be to develop specific, proactive objectives in key areas of the company's business. B.C. Hydro wishes to demonstrate increasingly an environmental leadership role in promoting the concept of sustainability in today's society, and intends that these objectives will bring about levels of environmental performance well above statutory and regulatory requirements. Management will ensure that the public has an opportunity to be involved in the process of establishing these objectives, and that they will be achieved at costs commensurate with our ratepayers' expectations.

New objectives will be set initially in seven areas: fish and water quality; recreation and public use; PCB management; debris management; vegetation management (including use of pesticides); air quality, and comprehensive waste management.

Another major component of the plan will be to develop a series of environmental management systems directed at ensuring compliance with regulatory requirements and that "due diligence" is being followed in the company's operations.

If you would like more information on environmental activities undertaken by B.C. Hydro, please contact P. Nigel Grant, Manager, Environmental Affairs, 17th floor, 333 Dunsmuir St., Vancouver, B.C. V6B 5R3

Copies of this Environmental Annual Report are available by writing our Information Centre, 2nd floor, 333 Dunsmuir Street, Vancouver, B.C. V6B 5R3; or by calling (604) 623-4152; or faxing (604) 623-3515.

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